Inspector Guidelines and Expectations – Role of the Inspector

CHAPTER NOTE
The specific duties and responsibilities of the inspector depend in part on the employing agency or company, however many of these duties and responsibilities are common to all inspectors. This chapter presents only the essential functions that are common to all inspectors. There is no substitute for on-the-job training from experienced inspectors or supervisors.

THE ROLE OF THE INSPECTOR

This section is intended primarily for inspectors employed by regulatory agencies. Except for enforcement issues, most of the material will also apply to inspectors working for private firms. Additionally, private inspectors may be called upon to monitor and document other matters such as costs, schedule adherence, and consumption of supplies.

Conduct

The inspector must have technical expertise in erosion prevention and sediment control. In addition, in order to achieve full compliance, the inspector must be able to deal effectively with people. For example, disputes sometimes arise about a site violation. The person responsible for the site may disagree with your assessment of the site. Neighboring landowners may be upset and demand that corrective action be taken immediately. At times like these, it is easy to become overly emotional. The inspector must remain impartial in order to gain the respect of all parties, steer them toward resolution, and achieve compliance. No matter what the situation, inspectors need to carry out their responsibilities in a professional manner and in accordance with the rules. Inspectors must be consistent in their inspections and enforcement, handling all sites, individuals, problems, and violations in the same manner. Inspectors must maintain their integrity if they are to do the job well and be respected as professionals.
In dealing with the public it is most important to follow proper legal procedures and to remain courteous and fair. If you fail to follow proper legal procedures youmay not be able to bring enforcement action against a violator. By showing proper courtesy and fairness, you encourage mutual respect among all persons involved. Parties responsible for construction sites are less likely to violate the rules if they see the inspector as a competent professional. Inspectors need to know how to deal with people. See Human Relations at the end of this section for guidelines on dealing with people who are angry or upset. The guidelines can be a big help in your job.

Compliance

Remember that the goal of the program is to prevent accelerated erosion and off-site sedimentation. As the inspector, you are the first person to determine if the performance standards and intent of the rule are being met. You are the key person ensuring that construction sites are evaluated fairly and consistently and that the responsible party keeps the site in compliance. The erosion and sediment control rules are performance oriented. That is, the measures used at a construction site ***must be effective in controlling erosion and preventing off-site sedimentation for the site to be in compliance.*** Following an approved plan and installing the control measures may not be enough for a site to be in compliance with the rules. If erosion and off-site sedimentation occur, the person responsible must install additional measures to correct the problem. The rules are also flexible, allowing the responsible parties to decide the most economical and effective means for erosion control. This encourages the use of innovative techniques. Refer to Section V of this manual for various bmp specifications. The inspector is a key individual in making this kind of performance based rule work because the inspector is the first person to recognize performance failures and report problems. The inspector's job is to:
1. Determine that an erosion and sediment control plan for the site has been approved.
2. Determine that all specified practices have been installed and are being maintained according to the plan.
3. Determine that off-site sedimentation and turbidity is being prevented.
If the inspector finds deficiencies, appropriate action must be taken to attain compliance.

Handling violations

As the inspector of the site, you play a central role in providing details of violations and subsequent corrections. The inspection records that you write are the basis for enforcement and civil penalties. You are the first person to determine whether the measures on the site are performing properly; thus, you are the first link in enforcing the erosion and sedimentation rule. Inspectors are often called to appear at enforcement meetings or hearings as witnesses to document a violation. ***You should write a report for every inspection of a site.*** When writing your inspection report, remember that it is a legal document. Your report must be written legibly, accurately, consistently, and in clear and concise language. Report all violations observed each time you visit a site even if you have reported some of them on previous visits. ***Always write inspection reports while you are on the site*** so that you will not forget items and can recheck conditions if you have doubts. Field notes are very effective in meetings. They should be organized, thorough, concise and legible. Make a habit of taking organized, well-written notes. It will pay off in your first enforcement case.
The private inspector must also document activities thoroughly and accurately. This will be the client's best defense in the event of a violation. Good documentation will show whether the client is a "habitual offender" or a

conscientious professional who has been overwhelmed by unusual events, often an important factor in determining a resolution.

SITE INSPECTION

Inspections don't "just happen". A great deal of planning and preparation goes into a proper and thorough inspection. Inspectors need to review construction plans, attend preconstruction conferences and be knowledgeable of the law and standards. Knowing why a site is or is not in compliance is a key part of the inspector's duty.

The inspection

An erosion control plan is designed to minimize erosion and control sedimentation. However, components of the plan may fail or the responsible party may not adhere to the plan. As an inspector of construction sites, your job is:

1. To be certain that all erosion and sediment control measures in the approved plan have been properly installed and maintained.
2. That erosion is being controlled.
3. That off-site sedimentation is being prevented.
4. That no turbidity in adjacent streams is being generated.

It takes time to learn how to inspect a construction site properly. Project sites are often large and can have many land-disturbing activities occurring at the same time, which can be confusing. Also, there are many considerations to keep in mind while conducting the inspection. You must be familiar with the rules, and many erosion and sedimentation control practices. With some experience, however, you will soon feel comfortable about making an official erosion control inspection. A proper inspection requires planning and a systematic approach. With careful preparation, you can carry out your duty and work cooperatively with all responsible parties so that those involved can do their jobs efficiently.

Tolerances

The inspector must be reasonable regarding dimensional and performance criteria while performing inspections. This requires an understanding of the intended function of the various BMPs. Obviously a catch basin with an opening designed to support a grate has a zero tolerance for being too small because the grate will not fit. If the opening is one-half inch too wide, the grate will fit and still be supported by the sill or lip. If the opening is two inches wide, the grate will fall in. This dimensional tolerance can be described as "half inch plus, zero minus". A stormwater pond is often designed with 1' (30 cm) of freeboard over the riser or spillway. High spots or slightly low spots will probably not affect the performance of the pond. On the other hand, it is critical that the lip of a level spreader is installed "perfectly" level. In this situation, high or low spots will both have the effect of producing concentrated flows. Thus there is almost zero tolerance, plus

or minus. Other situations are not as simple to define. The allowable (minor) amount of mud tracked, or dust generated, from a site may be somewhat subjective. Many factors are involved in determining performance tolerances, such as severity and frequency of infractions, efforts by the contractors, limitations of the technology and products available, and possibly several other factors. However tolerances are determined, it is essential to the integrity of the inspector and the agency that they are applied with consistency and impartiality.

Preparing for an inspection

The first step in inspecting a project is to review plans when first submitted. This review will alert you to potential problems at the site and weaknesses in the erosion and sedimentation control system design. While at your office, look for the following items in the plan. (There are other items that you may want to include as you gain more experience.)

1. Check contour maps and available aerial photos to see how the water flows through the site. Note where water enters and leaves the site. Determine the direction of flow in the general area and in the watershed where the project is located.
2. Note whether the site borders a sensitive area such as a stream or high quality water body. The boundary should be especially well protected from sedimentation.
3. Pay particular attention to critical areas such as step cut-and-fill slopes, stream crossings, channels, outlets of pipes and diversions, construction access routes and highly erodible soils.
4. Look for adequate access and space to maintain erosion and sediment control measures.
5. Make sure that the plan provides an installation sequence for measures to control erosion and sedimentation, with measures for one phase being installed before grading of the next phase begins.
6. Study the construction schedule to determine whether long periods of time exist between phases of construction. If so, temporary seeding or other temporary soil stabilization will be required.
7. Check to make sure that the plan requires all surfaces to be stabilized as soon as possible after completion of the project and within seven working days. Temporary and permanent seeding should also be specified.
8. Remember that when the contractor is finished, the entire site should be stabilized - no accelerated erosion and no off-site sedimentation should occur.
9. Be sure that the perimeter of the site is protected to prevent off-site sedimentation and keep off-site runoff from flowing across highly erodible areas during construction.
10. Make sure that maintenance plans are adequate and the contractor's procedure in monitoring the performance of control measures is specified. For Example, it should be clearly specified whether the general contractor, subcontractor, or construction manager is to do the inspection and maintenance.

11. Note any proposed borrow or waste areas and proposed measures for controlling erosion and sedimentation there.
12. Watch for existing areas that may not be in compliance, such as old highways and abandoned railroad rights-of-way. Those parties responsible for the land disturbance are responsible for erosion control even if ownership of the property has changed.
13. Make a list of the specific items of the plan that you want to inspect closely when you get to the site. This list can speed your inspection and remind you to check certain important points.
14. Reviewing the erosion and sedimentation control plan should provide you with a solid grasp of the proposed project. From the review you can identify parts of the erosion control system that may need to be strengthened and parts that should be watched carefully to see if the performance requirement is met. Your experience in the field and in the geographical area will provide valuable assistance in the approval or revision of the submitted plan.
15. Inspectors must also be familiar with the construction plans. Study these plans; identify and highlight sensitive areas, BMP placement and details, and other items of concern. The ability to read aerial photos is important because some construction projects now use aerial photos on which to draw the construction plans. It will take some practice to be able to recognize ordinary objects from the air. Many experienced people have found that aerial photos and topographic maps can help greatly in determining the effects of a project on the surrounding area. The 1:660 Scale is usually used. The United States Geological Survey (USGS) is a good source for topographic maps. These maps are drawn on a scale of 1:24,000. Reviewing the construction plan provides information needed for the next step of the inspection process, the preconstruction conference. Use the suggestions below to ensure that you are fully prepared for the conference.

Preconstruction conference

A preconstruction conference is one of the most valuable vehicles by which you can address and divert many potential erosion and sedimentation problems before they become catastrophes. This conference provides an opportunity for you to meet face-to-face with the responsible party and the contractor. In this way, you can establish the expectations for the project and start a good working relationship with the job superintendent. While holding the conference, keep the following suggestions in mind:
1. Clarify the objectives of erosion and sediment control and inform all parties about the specific requirements for compliance in this project. Also, discuss the inspection procedures and establish communications and scheduling so that everyone knows what will be happening during the project.
2. Designate a contact person for communicating concerns about erosion control. This will make future contacts much easier.

3. Be sure that all parties review a copy of the approved erosion and sediment control plan so that they know what is expected, and are prepared to carry out the plan.
4. Inform the responsible party and the contractor that the program is performance oriented and that the plan may need to be changed during the course of construction. Inform all parties about procedures for changing the plans.
5. Try to hold the conference on the site. There, the group can walk the site and compare the plans to see if the measures are appropriate, are located properly, and can be maintained once installed. Determine areas where sediment from the sediment traps and basins can be placed and stabilized when the devices are cleaned. The site is also the best place to determine if adequate access will be available to maintain the erosion control measures.
6. Discuss the schedule of clearing and grading. Emphasize that sediment control measures should be installed before the actual grading begins in order to capture sediment as it is generated. Be sure that the schedule allows for stabilizing surfaces with temporary and permanent measures during and between phases of grading and construction.
7. Discuss the maintenance requirements so that the responsible party and the contractor know who is responsible for inspecting, cleaning and repairing the measures. Regular inspection and maintenance may need to be supplemented with extra work if there is a forecast of a large storm, or to clean up after a large storm.
8. Establish open communications at the preconstruction conference; this provides a good foundation for your relationship with the responsible parties during the project.

Before you leave the office

Take the time to review the plans thoroughly before you go to the site, even if you have already reviewed them when they were first submitted.
1. Outline your approach for each inspection. It is necessary to know in detail the erosion control system and why each measure is specified.
2. Always take a copy of the approved plans with you to the site for quick referral.
3. Always bring the project file and necessary reporting forms.
4. Always take equipment for measuring (level, tape measure, turbidity sampling kit, etc.) and documenting (camera, camcorder).
5. Be sure to have all necessary personal protection such as boots, sun and insect protection, rain gear, water, First Aid kit, radio, etc.

Inspecting the site

At the construction site, ask yourself the following five general questions:
1. Does this project have an approved permit?
2. Is the erosion and sediment control system installed as shown on the approved plans?

3. Is erosion being controlled on the site?
4. Is sediment being contained on the site?
5. Is the potential for turbidity in adjacent streams minimized?

If the answer to ***all*** of these questions is YES, then the site is in compliance. File an inspection report stating that the site is in compliance and take field notes to support the inspection report. It is a good idea to keep track of the sites where the erosion and sedimentation control plans work well so that you can show others examples of good sites. If the answer to ***any*** of the above questions is NO, then the site is not in compliance. File an inspection report listing the items that are not in compliance. Your field notes should describe precisely the noncompliance and its location. Remember that others may need to use your field notes, so make them readable and understandable. The following points will help you in checking for compliance.

1. Carry a set of the approved plans to the site for your reference. They are necessary
to determine what measures make up the erosion control system and how they are to be installed and maintained.
2. Take detailed, orderly field notes as you do the inspection. Eventually, this procedure will save you time and possibly a second trip to the site. Be sure that your notes are neat, concise and complete. (Remember, your notes may be needed as evidence in court.)
3. Check in with the job superintendent when you arrive so that the contractor knows who you are and what you are doing. When possible, schedule appointments so that the contractor and other responsible parties know when to expect you.
4. Walk the perimeter of the site on your first inspection. This procedure will give you a good idea of the terrain and will alert you to any problems occurring from off-site water and off-site sedimentation.
5. You may want to start your inspection from the lowest point of the perimeter and work your way upstream through the stormwater management system. This helps to make you aware of the amount of sediment leaving the site and can help you in locating its source.
6. If sediment is flowing off the site, go far enough downstream to see the extent of the damage. In these situations, it is very important to document the damage. Make an estimate of the sediment volume. Photos and videotapes make very good evidence. Be sure to write the time, date and other items in your notes and on the inspection report.
7. If turbidity is present in nearby waters, sampling of the stream upstream and downstream of the discharge point can provide the best possible evidence that the site is in or out of compliance.
8. Bring necessary tools to measure the devices and disturbed areas in the field. Be sure that basins and traps are sized according to the plans; channels and diversions have the proper grade, and contributing areas for the control devices are no larger than those used in the design.
9. Pay particular attention to the maintenance of erosion and sediment control measures. All measures require regular maintenance and may require special

attention after severe storms.
10. Keep in mind that when certain structural measures fail fromimproper installation or maintenance, more off-site sediment damage may occur than if the device had not been installed.
11. Always fill out an inspection report for each trip to a site while you are still at the site. The pertinent inspection points are still fresh in your mind and you can easily recheck items that may be in question.

Causes of noncompliance

When you find a site that is not in compliance, it is important to determine why. By determining the cause(s), solutions become more apparent. Problems of erosion and sediment control on sites fall into three categories:
1. The responsible party has not made efforts to comply with the rule.
2. There are design errors in the erosion control system or the site conditions have
changed.
3. The installation or maintenance of a measure is faulty or inadequate.

Little or No Effort to Comply

Noncompliance in the first category is easy to spot. The responsible party may believe that the project does not come under the jurisdiction of the rule or may intentionally disregard the provision of the rule. Quite often these sites are found by inspectors while driving by. Therefore, be observant in your territory.
Once you have found a noncomplying site, inform the responsible party that compliance is mandatory by Rule. On the inspection report, note that the responsible party has been informed of the law and list the items that are not in compliance. Appropriate enforcement action should then be taken. These are some of the causes of noncompliance within this category:
1. Not submitting a plan
2. Failing to follow the approved plan.

Inadequate Design or Changes in Site Conditions

Violations and failures may occur because the design was inadequate or the site conditions have changed since the plan was prepared. In this event the plan needs to be revised and approved. The inspection report should note all items of noncompliance and the need for a revised plan. Compare the original design in the plan to conditions in the field. Look for changes in the site, conditions and construction plan. Ask yourself the following questions when checking
for violations caused by design errors and changes.
1. Are the planned measures retaining the sediment on the site?
2. Are there modifications to the plan?
3. Are ground covers adequate for the slope and orientation of the areas to be protected? Is the slope too steep for the ground cover chosen?
4. Is the perimeter protected, given the conditions at the site?
5. Have the contributing drainage areas changed significantly, thereby potentially

overloading the control measures? Are additional control measures needed?
6. Is the planned and ongoing maintenance adequate for the existing conditions? Again, appropriate enforcement action should be taken.

Faulty Installation and/or Poor Maintenance
Most noncompliance occurs because measures were not installed correctly or maintained properly, or both. Determining the reasons why the measures are failing requires technical knowledge about the devices and how to construct them properly. In the following three sections, you will find ideas on how to inspect erosion control devices and stormwater management systems, and what to look for in their construction.

INSPECTING EROSION AND SEDIMENT CONTROL PRACTICES

Inspecting Individual Practices

The effectiveness of an erosion and sediment control system depends on the design, installation, and maintenance of the individual practices. It is only when all three efforts have been done properly that the system will function to prevent accelerated erosion and off site sedimentation. Each practice has specific requirements to function properly. Inspectors must be familiar with these requirements to ensure that each practice has been designed, installed and maintained properly. When you are inspecting a practice in the field, first check that the practice has been installed according to the design specifications on the approved plan. If the practice has been installed as shown on the plan, then check the appropriate section in this chapter for items that should be given special attention for each practice group.

Entrances and Exits

Erosion can be a special problem around all entrances and exits, access roads and construction roads. Erosion in these places can cause mudholes, gullies, muddy pavement, dust, and complaints from neighboring landowners. Construction roads, even temporary roads, need to be stabilized to prevent erosion. Look for the following while conducting your inspection.
1. Entrance and exit pads should be built with coarse gravel and stone that are sufficient to prevent tracking of sediment onto streets or other public rights-of-way and prevent the pad from sinking into the soil.
2. Sites with heavy clay soils may require the installation of a wash rack to control tracking of sediment onto roads.
3. On unstable or wet soil, the stone should be spread over a layer of geotextile fabric to keep the stone from being pressed into the soil.
4. Pads may need to be extended to be effective.
5. All runoff from construction roads should be diverted to sedimentation traps to retain sediments on the site.
6. Pads and roads must be maintained (adding more clean stone) to ensure proper functioning.

7. Public roads must be swept as required to keep them free of sediments and stone from the site.

Inlet Protection

Inlet protection prevents sediment from entering the storm drains and leaving the construction site. By using inlet protectors (excavated, fabric, gravel bags, block and gravel, or prefabricated filter bags), the designers can make use of the storm drains to discharge storm waters during construction. Look for problem areas within each of these practices.

Excavated Drop-inlet Protectors
1. If sediment has filled the excavated pool around the inlet, the contributing area for the inlet may be too large or the inlet protection structure may not have been maintained properly.
2. The capacity of the excavation around the drop-inlet protectors must be adequate for the contributing area. Also, the excavated area should be frequently cleaned and maintained.
Fabric Drop-inlet Protectors
1. These structures frequently fail because the posts are not set against the inlet and
the tops of the posts are not supported or braced to one another.
2. Water should fall directly into the inlet opening, not onto the unprotected soil around
the inlet box.
3. The fabric must always be buried at the bottom to prevent undercutting and to provide structural strength. The fabric should be set a minimum of 12 inches (30 cm) in the soil, and the trench backfilled with compacted earth or crushed stone.
4. Drop-inlet protectors should be set low, no more than 1.5 feet high (45 cm), to allow
water to flow over them without collapsing, and to prevent water from overflowing the pool behind the fabric, thus bypassing the storm inlet. In some cases a dike may be required to prevent bypassing.

Prefabricated Filter Bag (Siltsack)

1. Remove the grate and then remove the sack when sediments are within one foot of the grate. Proper use of heavy equipment will help avoid accident or injury.
2. The bag may be replaced, or it may be emptied, cleaned, and reused.

Sediment Traps and Barriers

Sediment traps, basins, and barriers are used to retain sediment on the site to protect streams, lakes, drainage systems, and adjacent property. These devices are used at the outlets of channels, diversions, and other runoff conveyance

measures to allow sediment-filled water to pool and sediment to settle. These measures are often used as the last line of defense to stop sediment from leaving the site; therefore, inspect them closely.

Sediment Traps

1. The drainage area must be limited to 5 acres (2 ha) or less.
2. The size of the sediment pool must be adequate for the disturbed area.
3. The spillway of sediment traps must be large enough to carry the design flow. The crest of the spillway should be level to allow even distribution of flow.
4. Geotextile fabric (filter cloth) must be installed under the outlet section to prevent undercutting.
5. The slopes of the inside and outside faces of the outlet section must not be greater than 2:1 to prevent stone from washing away.
6. The earth dike forming the basin must be compacted to prevent it from failing when pool is full. The height and top width must be adequate to hold the water in the pool.
7. The dike must be higher than the outlet weir section or the water will wash out the dike at its lowest point.
8. Sediment traps should be cleaned when the sediment is one-half the design depth to maintain adequate storage volume.

Sediment Basins

1. The size of the sediment basin must be adequate for the disturbed area. Limit the drainage area to 100 acres (40 ha).
2. Sediment basins require special attention because their large size makes them very hazardous if they fail. Thus, it is important that sediment basins are carefully constructed to follow the dimensions, grades, elevations, pipe sizes, emergency spillway sections and other specifications as shown on the approved plans.
3. The conduit must be installed and function properly. The conduit joints must be watertight and must have anti-seep collars to prevent piping along the conduit.
4. Anti-flotation weights must be used to prevent conduit movement.
5. The soil in the embankment must be compacted to prevent piping. Hand tamping is necessary around the conduit.
6. Trash racks can cause failures if they are improperly designed. They should catch large debris to prevent the conduit from being clogged but should not have such fine openings that they become clogged with leaves and cause water to overtop the embankment.
7. There should be at least 1 foot (30 cm) of freeboard above the emergency spillway flow depth to prevent overtopping of the embankment.
8. The emergency spillway should be large enough to carry a 25 year, 24 hour storm flow safely without eroding. It should be constructed in undisturbed soil and properly stabilized.
9. Large basins must be accessible to allow frequent cleaning. The sediment removed from the basins should be placed where it will not be lost off-site.

Perimeter Controls (silt fences)

1. Silt fences fail because they are improperly designed, installed, or maintained. Silt fences must be buried at least 8 inches (20 cm) and backfilled with compacted soil or stone to prevent undercutting. These fences must be adequately supported to prevent collapse from the pressure of the water and accumulated sediment.
2. Silt fences should never be placed across streams, conveyances, or areas of concentrated flow. The flowing water will collapse or undermine the fence.
3. Silt fences cannot withstand flows from large areas or steep slopes. The size of the contributing area must be limited to 1 acre per 100 feet (0.4 ha per 30 m) of fence.
4. Sediment fences require frequent maintenance. The accumulated sediment should be removed often.

Stream Crossings

Stream crossings must be specifically addressed and allowed by the permit. Inspect stream crossings carefully because any sediment will enter the stream directly.
1. Debris and construction material should be removed from the stream to prevent water cutting around culverts and bridge abutments.
2. Culverts cause additional soil disturbance when they are installed or removed. Provisions should be made to reduce sedimentation in the stream during installation and removal of culverts.
3. Fords should be used only for shallow or intermittent streams. Use geotextile fabric covered with properly sized stone to prevent the stone from being carried downstream.
4. Bridges cause the least disturbance to the stream and should be used where practical.
5. Banks should not be filled to shorten the length of bridge required. Fills restrict the stream channel and can easily wash out.
6. Approaches to stream crossings should be stabilized and should have diversions to prevent runoff from entering the stream.

Buffer Zones

The use of buffer zones to protect streams, lakes, and other bodies of water is always recommended and frequently required. Check for the following points when buffer zones are required on a site.
1. Buffer zones along water bodies must be wide enough to stop all visible sediment in
the first one-fourth of the buffer nearest the construction work.
2. Avoid the use of in-stream controls such as check dams, weirs and the like.

Maintenance

Maintenance of erosion control devices is frequently overlooked on many construction sites. It is one of the most critical points in preventing accelerated erosion and off-site sedimentation.

1. The responsible party should provide for continued inspection and maintenance of erosion control practices. Maintenance for a disturbed site should be planned to continue through the life of the project.
2. All devices in the erosion and sediment control system should be inspected regularly (especially after storms). The erosion control plan should specify regular inspections and proper maintenance, such as cleaning and repairs, for each practice.
3. Sediment traps and basins should be cleaned when the settling pools are half full.
4. Contractors frequently run over diversions with heavy equipment, breaking down the dike and allowing overtopping. If the contractor must drive over the diversion, it should be stabilized with gravel and built up to the design elevation above the channel.
5. Silt fences should be repaired immediately if they are damaged.

Remember that the regulations are performance-oriented. Even if practices are installed on a site according to the approved plan, the site is only in compliance where erosion and sediment are effectively controlled.

INSPECTING STORMWATER SYSTEMS DURING CONSTRUCTION

No stormwater management system can function properly unless it has been properly designed and constructed. A review of the design should be conducted under the supervision of a Florida registered professional engineer. The responsibility of insuring proper construction falls upon the inspector. While some inspectors operate from a regulatory prospective, many public and most private inspectors function as "the owner's representative". Their job is to make sure that the owners, public or private, get the quality facilities that they pay for. Improper construction of a single element of the system will cause premature failure and/or increased maintenance. This expense will initially, and often finally, be borne by the owner. The following items highlight important issues in the construction of stormwater management systems.

Stormwater Impoundments (Ponds)

Stormwater management ponds are the largest component of a stormwater system. Both water quality treatment and flood control are achieved in these impoundments. Due to the volume of water contained in ponds, failure can cause considerable damage. Carefully examine the following when inspecting ponds under construction.

1. Does the construction comply with local material and equipment requirements for earthwork, concrete, other masonry, reinforcing steel, pipe, water gates,metal, and woodwork? Look for defects such as broken bells and spigots on concrete pipe, dented metal pipe, chipped coatings, improper aggregated or fill material, etc.. Is appropriate compaction equipment, including small tampers, on hand? What is the dewatering method, discharge, volume, and frequency?
2. Has the subgrade been stripped of topsoil, vegetation, organic debris, and large rocks? Are all fills compacted to specifications? Is the cut-off trench to dimensions and properly backfilled?
3. A major cause of detention system failure is water traveling along the outside of the principal spillway. This is called piping, and it generally occurs along a corrugated metal or concrete pipe. Is the method of installation on the plans? Is the trench bottom compacted, uniformly smooth, and dry? Are pipe cradles and anti-seep collars in proper location, and of specified dimensions and materials? Is the riser in proper location, and of specified dimensions and materials? Are all connections water-tight? Is backfill around structures and pipes accomplished with small tampers and rollers in 8 inch (20 cm) maximum lifts? Retention basins operate purely by infiltration and evaporation, and generally do not have a principle spillway
4. The reason most stormwater embankment ponds remain stable is that the mass of earth in the embankment is heavy enough to prevent slippage of material caused by water pressure on the upstream slope. Steep side slopes are not only more dangerous to the general public, but they also reduce the total

mass of earth material in the embankment. This can increase the potential for embankment
failure. Are interior side slopes no steeper than 4-to-1 and exterior side slopes no steeper than 3-to-1? Has proper compaction been achieved according to visual inspection, and according to engineering testing?
5. Use a Locke hand level (Locke level) or surveyor's level and rod to check elevations in and around the impoundment. Is the floor at the design elevation? Check grading on any "benches" or shallow littoral slopes. Are inlet and outlet elevations in proper relation to the pond bottom, the embankment top, and the emergency spillway? If a retention basin, has the floor been excavated with light weight or low ground pressure equipment? Has the retention basin floor been disced or plowed to a depth of one foot?
6. Is the emergency spillway constructed on a cut or properly compacted fill? Is the emergency spillway in the proper location and built to approved dimensions? Are elevations and grades as shown on the plans?
7. Are all pretreatment forebays, sediment traps, stilling basins, etc. built according to plan?
8. Are all inlets to the pond provided with energy dissipators? Are the outlets from the principle and emergency spillways provided with energy dissipators? Do outlets discharge to stabilized areas or flowpaths?
9. Are all vegetated areas topsoiled and mulched? Is the seed and/or plant selection effective? Is all vegetation warrantied for one or two years? Are all non-vegetated surfaces covered with properly installed impervious or semi-pervious materials? Are those in the right place? Are dimensions and materials per plan?
10. Impoundments are generally located in the lowest area of the site. Look for sediment accumulation in or approaching the pond. While this does not indicate a defect in the pond, it will adversely affect the performance of the pond. Trace the sediments back to their source, and notify the contractor to fix the problem.

Underdrains and Filters

Stormwater underdrain and filtration systems are used in stormwater management facilities to provide treatment where natural soils or high ground water restrict percolation. They usually consist of a system of perforated pipes surrounded by gravel and/or filter fabric. The following installation issues are important for the system to perform as designed:
1. Filters may be installed at the toe of the inside embankment slope (i.e. in-bank filter), they may be trenched into the basin floor, or they may be mounded on top of the basin floor. Regardless of location, is the bed for the pipe uniformly smooth in either undisturbed or properly compacted soil?
2. Examine the materials to be used. Is the geotextile as specified? Is the aggregate of the specified size and composition, and is it washed? Are pipe materials, sizes, perforations and connections correct?
3. Underdrains are generally designed with minimal slope. Look down the length of the pipe to spot high or low spots. Double check with a level.

4. Look at the pipe connections. Are there any gaps larger than 1/4 inch (3 mm)? Are the pipe ends capped or connected to clean-outs? Any pipe connections which will not be in gravel envelopes should be water-tight.
5. Where does the filter fabric belong? Some designs call for fabric wrapping the pipe (i.e. a "socked" pipe). Others call for a fabric envelope outside of the gravel.
6. Gravel is often installed in two operations: first a 3 inch (8 cm) bed is placed, then the pipe is installed, then the sides and top are backfilled with gravel. Is there a minimum of 3 inches (8 cm) of gravel all around the pipe? Has the gravel placement disturbed the pipe?
7. What happens next? Some designs call for filter cloth over the gravel. Others require filter cloth, topsoil, and sod.

Exfiltration Trenches

Exfiltration trenches are very vulnerable to clogging of filter fabric. Because they are built underground and then buried, they are difficult and expensive to repair. Do not begin trench construction until it is certain that sediment-laden runoff can be kept out of the trench. During construction, look for the following:
1. Is all contributing runoff diverted? If not, is runoff from a stabilized area? If not, is runoff filtered or allowed to settle?
2. Check the location and dimensions of the trench. Also, check distances to foundations, wells, septic systems. Know the location of any nearby underground utilities.
3. Excavation should be from above with a backhoe, wheel trencher, or ladder trencher. Heavy equipment should not enter the trench as this will cause compaction of the soil. Excavated soil should be hauled away or stockpiled at least 10 ft.(3 m) from the edge of the trench. If kept on site it should be protected from erosion by plastic. By day's end, is the trench protected from stockpile or roadway sediments?
4. When excavation is complete check dimensions again. Are there any roots or rocks which could puncture the filter fabric? Is dewatering required? If so, determine and record the water table elevation and compare with the approved plans.
5. Verify that filter fabric is as specified. Has fabric been installed without tears or gaps? Adjacent sheets should overlap 12" - 18" (30 - 45 cm) and overlap the top of the trench by 18" - 24" (45 - 60 cm).
6. The aggregate material should be inspected prior to placement to ensure that it is clean material and free of debris. The type and size of the material should be as specified on the approved plans.
7. Inspect the exfiltration pipe before placement. Is it of the specified material and size? Are the perforations of the approved size and spacing? Are there any defects or damage to pipes, joints, or connections? Is fabric required around the perforated pipe?
8. An observation well should be installed in the aggregate to allow future inspections to determine whether the facility is functioning as designed. The observation well should consist of a perforated PVC pipe, 4 to 8 inches (10 -20

cm) in diameter and have a foot plate and a cap. The footplate will prevent the entire observation well from lifting up when the cap is removed during future inspections.
9. When course aggregate backfill is complete, it may be covered with filter fabric or plastic, as specified. Is fine aggregate or ordinary fill placed over the rock and fabric? What are the compaction requirements and procedures prior to final roadway pavement?
10. Maintain sediment controls and good housekeeping through project completion.

Infiltration Paving (Porous Pavement, Concrete Grid, Modular Paving, Grid Confinement Systems)

Infiltration paving refers to road and parking lot surfaces whose design allows for stormwater runoff to travel through the surface into the ground. These practices consist primarily of a "reservoir" layer of course aggregate, underlaid by a geotextile and covered with a hard yet pervious surface. The fabric keeps the aggregate separated form the subgrade soil and the hard surface keeps the aggregate in place and protects it from compaction. The geotextile and the hard surface work together to provide the structural support for vehicular traffic. While the concepts are quite simple, installation is very sensitive to workmanship and housekeeping. During construction, look at the following:
1. To help preserve the natural infiltration rate of the subgrade soils prior to excavation, the infiltration paving area should not be excessively traveled by heavy construction equipment that causes excessive compaction of soil pores. Has the area been marked off and traffic kept off it to the greatest extent possible? Are dimensions and location as per plan?
2. The area of the paving should be carefully excavated to prevent excessive compaction of the soils during the subgrade preparation. Has grading been carried out using low ground pressure equipment?
3. Once the subgrade has been reached, filter fabric should be placed. Is the fabric as specified? Are adjacent sheets overlapped 12" - 18" (30 - 45 cm)? Look for tears or gaps in the fabric. Check the type, size, and spacing of staples or pegs. What details are shown along the perimeter?
4. Once the fabric has been placed, the reservoir course is placed to the design depth. Is the aggregate clean, washed stone having a void ratio between 30 and 40%? The reservoir course should be laid in 12" (30 cm) maximum lifts and lightly compacted. Has the aggregate been uniformly spread?
5. In grid confinement systems, the HDPE grid is placed directly on top of the geotextile. The open cells of the grid are then filled with aggregate or soil. The filled cells will then support the weight of equipment. Have any cells been crushed prior to filling? Some of the modular paving systems are also placed directly on the geotextile and then filled.
6. Porous pavement and some modular paving systems use the reservoir layer of course aggregate. This is then covered with a two inch (5 cm) granular filter layer of washed 1/2" (13 mm) gravel. Is this layer also uniformly smooth and lightly

compacted?
7. Modular pavers are laid on the granular filter layer. Open face types are then filled with aggregates or soil.
8. Pervious concrete is poured on the granular filter layer. The pouring temperature and the mix (% course and fine aggregates, cement, and water) should be consistent with those recommended in the specifications prepared by a Florida registered professional engineer. The engineer or designate should be present during placement. Samples of the concrete should be taken from each truck for immediate and future analysis.
9. Test the final product by pouring several gallons of water in different locations and recording the results.
10. As with all filtration and infiltration BMPs, infiltration paving systems are very sensitive to clogging. Sediment control must be maintained before, during, and after construction. All contributing areas must be stabilized in order to attain a reasonable service life.

Swales

Swales use infiltration as their primary means of reducing stormwater pollutants and total volume. They are considered as a subset of biofilters since vegetative filtration is also important. While biofiltration swales and filters rely on passage of water through vegetation for pollutant reduction, infiltration swales have designed blockages, such as swale blocks or check dams, which ponds water and induces infiltration. In both situations, slopes must be very gradual to increase residence time and reduce flow velocities. Examine the following when inspecting the construction of infiltration swales:
1. To help preserve the natural infiltration rate of the subgrade soils prior to excavation, the infiltration swale area should not be excessively traveled by heavy construction equipment that causes excessive compaction of soil pores. The area should be marked off and traffic kept off the area to the greatest extent possible. This is especially important at residential construction sites where individual residential contractors enter building sites with numerous trucks. The driveway areas should be the access points for contractors.
2. Has runoff been diverted to allow construction of the swale and establishment of vegetation?
3. Is excavation performed with light weight or low ground pressure equipment? Are all roots, rocks, and unsuitable soils removed?
4. Are excavated materials removed, stockpiled and covered, used for fill, or otherwise stored where sediments will not migrate back into the swale?
5. Check the dimensions, location, and grade of the initial excavation.
6. Are swale blocks required? How many, what size and what spacing? What materials are used? Are they properly compacted? Are they covered with sod, gravel, or erosion control blankets or nets?
7. Examine the proposed swale lining. Will topsoil, mulch, or sod decrease the cross-sectional area below the approved design? Is there a stone or riprap center

drain which would reduce capacity? Recheck the dimensions after the lining has been installed.
8. Reinspect after several weeks for vegetative establishment. Look for accumulated sediments and trace back to their source. Maintain traffic control and restrict crossings to driveway locations. Monitor standing water to verify volume recovery within 72 hours.

Runoff Control Diversions

Diversions (dikes and channels) should be constructed as shown on the approved plans or failure of these measures is likely to occur. The most important factors in installing a diversion are its size, the grade, the elevation of the dike above the channel, compaction of the dike, and stabilization of the channel. To help assure compliance, the following should be evaluated:
1. A dike and its channel must be on the proper grade to ensure that the water flows in the desired direction. ***Watch for abrupt changes or reversal of grade on diversions -- overflows and failures occur in these places.***
2. Dikes must be large enough to meet the design water flow with 6 inches (15 cm) of freeboard. Be sure that they are sufficiently wide at the top, a minimum of 2 feet (60 cm) and the side slopes are 2:1 or flatter.
3. Dikes must always be compacted because loose soil will wash out.
4. Channels must have a large enough flow area to carry the expected volume of water.
5. Channels on steep grades must be lined to withstand the expected water velocity.
6. Diversions should generally parallel the site contours.
7. Diversions must be maintained routinely for proper performance, with special attention after severe storms.

Runoff Conveyance - Channels, Conveyance Swales, Slope Drains, and Flumes

Runoff must be controlled to ensure that it will not cause accelerated erosion or off-site sedimentation. Channels, swales, slope drains, and flumes must carefully follow the design specifications. Check these key points as you conduct your inspection.
1. Vegetated channels require protection until the vegetation is fully established. Well-anchored sod, mulch, mats, or netting should be used. Water should not be allowed into the system until it is stabilized.
2. Make sure that the flow cross-section is not reduced when riprap is used to line a channel. The channel excavation must be increased (or overcut) to compensate for the thickness of the riprap.
3. Look to see that channels lined with riprap have a layer of geotextile fabric (filter cloth) under the riprap. Also, the riprap should be inlaid into the channel bank to a depth of 1.5 times the d_{max} size of the riprap and set into the soil surface to prevent undercutting.

5. Inspect outlets of all runoff conveyances to ensure proper outlet protection.
6. Be sure that the slope drains have watertight joints in the pipe and that the pipe is well anchored to prevent movement.
7. Slope drains frequently fail because the water "pipes" around the inlet to the pipe. Check to see that the soil at the inlet is compacted to prevent piping. Anti-seep
collars are also effective in controlling piping.
8. Flumes have steep slopes and carry water at very high velocities. Check that the outlets are stabilized to prevent erosion and that the inlets are designed to prevent water from washing around or under the chute.
9. Determine if the flumes have subdrains, necessary to prevent hydrostatic uplift.
10. Bends in flumes are difficult to design and build and should be avoided. Check any bends in a chute for signs of overtopping or erosion.
11. Gullies in the channel bottom mean that the velocities are too high. In this case, the channel must be redesigned by either lining the channel to withstand the flow velocities, changing the grade, or altering the channel cross-section to lower the velocity.
12. Sloughing from the channel sides indicates stability problems. Causes of sloughing include a high water table, unstable soils, channel banks that are too steep, or water velocities that are too high.
13. Overbank erosion, or flooding, may result from debris and sediment accumulation. The damaged areas should be rebuilt and the channel restabilized according to plan
specifications.
14. Sediment below the channel outlet indicates that erosion is occurring either in the channel or its watershed. The problem should be located and corrected.

Outlet Protection

Outlet protection is used to reduce high velocity flows from channels, culverts, pipes, and other high velocity structures. Concrete stilling basins may be required for outlets that have overfalls or where a riprap apron would be too long. Check the following points of outlet protection practices:
1. The installation of riprap is often problematic for outlet stabilization structures. The riprap should be inlaid into the soil to a depth of 1.5 ft. (45 cm) times the d_{max} size and have a layer of geotextile fabric under the stone.
2. The finished structure should be large enough to handle the full volume that the outlet was designed to carry. The cross-sectional flow area can be seriously reduced if no compensation is made for the thickness of the riprap.
3. The riprap should extend far enough downstream to reach a stable section of the stream. The purpose of the stabilization structure is to dissipate the energy of the water and slow water movement to keep the channel from eroding.
4. The apron of the outlet structure must be level to prevent the water from undercutting the downstream edge of the apron.

5. Level spreaders must be constructed on undisturbed soil; no fill is allowed (the fill will settle and the lip no longer will be level). Also, the lip must be level if the spreader is to work.
6. The natural discharge area of the level spreader should handle the flow without eroding and not reconcentrate the flow (which will cause rills or gullies).

Ground Covers (Surface Stabilization)

Types of ground cover can be divided into three groups:
I. Hard surfaces
2. Semi-hard surfaces
3. Soft (vegetative) covers
This section provides some ideas on what to look for when you are inspecting a site using ground cover for erosion control.

1. Hard Surfaces
Hard surfaces are those that include pavement, concrete, and revetment. Some of these surfaces can be cast in place using wooden or fabric forms, or they can be installed in large mats.
1. Look for proper hydrostatic pressure relief for solid slabs or liners.
2. Make sure that liners on channel slopes extend far enough up or away from the water to prevent water from undercutting, overtopping, or bypassing the liners.
3. Be certain that proper vegetation is planted in the hollows of the surface. Also, the soil filling the hollows should be well prepared to provide the best growing conditions for the plants.
4. Watch for accelerated erosion and high water velocities at the toe and top of hard-surfaced slopes and at the outlets from hard surfaces.

2. Semi-hard Surfaces
Semi-hard surfaces include riprap, gabion mattresses, modular pavement, and grid confinement systems. These surfaces are often used to line channels and cover slopes.
1. Semi-hard surfaces can be washed away by high water velocities. Look for failure by washout, or look for filling of voids by smaller particles to indicate success.
2. Flexible channel liners should be placed to blend with surrounding land surface to ensure that water will flow into the channel without erosion, not along the side of the lining.
3. Check to see if the channel lining is installed according to the plan, has not decreased the cross-sectional area, and is performing properly (ie. stays in place).
4. Ensure that adequate flow area has been provided.
5. Semi-hard surfaces should have geotextile fabric or a crushed stone filter underneath to prevent washing of the fine soil particles.
6. Make sure that dust control is being practiced for areas covered with stone

aggregates or gravel.

3. Soft Ground Covers
Soft ground covers (such as vegetative ground covers) are the most common and are used on moderate slopes not exposed to high water velocities. Mulches are sometimes used alone as ground cover but require frequent maintenance. In depth information for inspection is found in the following section, INSPECTING VEGETATION FOR USED FOR EROSION CONTROL.

INSPECTING VEGETATION USED FOR EROSION CONTROL

More area is protected from erosion with vegetation than with any other erosion control means. Knowing how to choose and establish the proper vegetation can prevent soil loss and sediment problems.

Vegetation For Erosion Control

Vegetative cover is the principal means used to stabilize soil surfaces. With the selection of the proper species and appropriate maintenance, vegetative cover provides inexpensive, long term protection with moderate maintenance. Construction projects present a wide range of conditions for vegetation. This section describes what to look for when vegetation is used for erosion control. A vegetative plan is one of the keys to a well-executed project. An effective plan specifies the appropriate plants for each disturbed area, describes proper soil preparation methods and indicates when and where to plant. Vegetation should be established as soon as possible after grading. Planting should be coordinated with construction so that areas do not remain uncovered, thereby reducing unnecessary amounts of runoff and sediment.

Consider the Site and Its Intended Uses

Vegetation works well only if the selected plant species is suitable for the climate, the soil, and the intended use for the area. Remember that at certain times of the year or under special conditions it may be necessary to use temporary vegetation before establishing permanent vegetation. Ask these questions when you inspect sites using vegetation for erosion control.

Is the plant type appropriate for the soil and the slope?

Plants must have fertile, well-prepared soils to grow properly, a requirement rarely met on a graded slope. Heavy, dense subsoils may be too infertile to support certain plants. Graded slopes may be too steep or too rocky to prepare adequate seedbeds. Steep slopes may need to be sodded or covered with riprap or concrete.

Is the plant properly chosen, given the climate and orientation of the area?

It is very important that the right plant be placed in the right location for the most effective use. Guidance is provided by the NRCS, FDEP, your regional Water Management District, or a qualified nurseryman.

Is the vegetated area being maintained?

Frequently the degree of maintenance required to keep a certain type of plant growing is overlooked. The responsible party must provide higher maintenance for some ornamental shrubs and grasses. Also, check that the maintenance crews can reach the planted area to provide the necessary care.

Is the area subject to high velocity flow?

Some areas, such as channels and steep slopes, may require sod, riprap, or concrete linings to prevent erosion.

Is the area going to be occasionally inundated?

This would have an effect on what should be planted and where.

Check Seedbed Preparation

Graded areas are usually compacted and have little topsoil when planting is started. If practical, the soil should be tested so that the proper amounts of lime and fertilizer can be added. Check the following to determine if the vegetation will be adequate.

1. Keep in mind the essentials for plant growth; an adequate supply of nutrients, water, and air in the root zone. Slopes that have been graded are often too compacted and smooth to establish plants. It is necessary to apply fertilizer and lime, prepare a proper seedbed, and roughen the surface to provide required nutrients and adequate rooting depth.
2. Fertilizer and lime must be added, and then incorporated to a depth of 4 or more inches (20 cm) by chiseling, plowing, or roto-tilling. This preparation also enhances water and air infiltration to the root zone.

Check for Proper Mulching

Seeded areas should be mulched to protect and help establish erosion control vegetation. Mulching holds the seed and fertilizer in place, protects the soil, and conserves moisture. Mulching also encourages rapid seed germination by preventing soil crusting and insulates the soil against rapid temperature changes. The following points will help you determine if mulching is adequate.

1. Look for a proper thickness of mulch. Few areas can develop a strong growth of vegetation without mulching, and mulches are often too thin to be of much help.
2. Mulch needs to be well-anchored to work properly. This requirement is often overlooked, causing many failures and much added expense for re-seeding. On flatter slopes, mulches can be tacked by spraying on tacking agents that bind the mulch, preventing it from being washed or blown away. Crimping also works well on flatter slopes and level areas.
3. For steeper slopes, mulches overlaid with netting or mats can be used. Netting and mats should be anchored with long staples at the proper spacing to provide

the best resistance to washing. Thicker and more durable mats should be used on steep slopes, areas that are exposed to high-velocity flows, and areas where vegetation needs more help to become established.

Ensure Maintenance of Vegetative Cover

Maintenance is the key to adequate erosion control vegetative cover. The inspector must ensure that the vegetation is protected to allow the best germination and strongest growth. Even after the vegetation has emerged, mulches and mats must be maintained to prevent washing during the next rain. Watch for areas where the mulch is too light - the mulch can blow away or wash away in the next rain. The owner/developer must have new mulch applied and must anchor it to prevent washing. Damage to seeded areas usually happens where the mulch is improperly anchored. These areas will require immediate repair. The responsible party should fill the eroded area if needed, apply new seed, lime, and fertilizer, and apply an adequate layer of well-anchored mulch. If the area is in a zone where the erosion potential is high or if the practice called
for in the plans is inadequate, the responsible person may need to use a heavier mat to provide more protection for the vegetation. Look for a means of access to the vegetated areas. The responsible party cannot provide maintenance if crews cannot get to the area. This is especially important for areas where high-maintenance ornamental shrubs and turf grasses have been planted.

Human Relations

The hardest part of an inspector's job is dealing with people. You will be working with contractors, developers, neighbors, and concerned citizens. All have rights as citizens and as human beings. To deal effectively with people, you must be fair and consistent. You must follow the rules governing erosion and sediment control, and you must apply them fairly. Fairness means treating all people with courtesy and respect. If you show respect for the other person, that person is more likely to show respect for you. It is important to be as consistent as possible. If you apply the rules consistently to every situation, the people you deal with will know what to expect from you and your agency. Perhaps the most challenging part of being an inspector is carrying out your responsibilities in a professional manner. Sometimes you may feel pressured not to cite violations, but it is your job to make sure all rules are followed. The objective is to prevent accelerated erosion and off-site damage from sediment. To do this job well and be respected as a professional, you must maintain your integrity.

You will visit many construction sites, offices, and other agencies. For these visits, prepare a short introduction explaining who you are, what your job is, and why you are there. Give a business card to those you meet to help them remember your name and the role of your organization.

Dealing With Angry or Difficult People

Individuals who have complaints frequently come to the inspector. Consequently, the inspector often has to handle heated confrontations. When a person voices a complaint, you will not have time to prepare a response. Therefore, you must resolve the situation spontaneously. You can be prepared, however, by developing skills for dealing with conflict situations. The general guidelines in the following section will help in handling angry people.

Key Steps

A situation with an angry person should be handled in a manner that is satisfactory to the person, yourself and the organization you represent. Your organization relies on you to handle these situations effectively. Use these steps as a guide for developing your skills in dealing with angry people. You can tailor these skills to fit your own personality and style.

Step 1. Maintain a friendly and professional manner.

You are likely to be the first person an angry individual confronts. Be careful not to argue because it will only make the person become defensive and even more difficult. * Show an interest in the person's problem and express your desire to solve it.

* Do not let the person's anger arouse your desire to retaliate. Handling a conflict situation diplomatically is your professional responsibility and can be rewarding.
* Do not take what the individual says personally. Though the anger may be directed at you, the person is probably angry with your agency or regulations, or another agency, person, or rule. The individual probably feels that someone has treated him or her unfairly.

Step 2. Acknowledge that a difficult situation exists.

Show that you take the complaint seriously. It is important that you help the person maintain self esteem. The complaint must not be viewed as unimportant. The person would not be complaining if he or she did not consider the problem important.

* Choose words and use a tone of voice that show sensitivity to the party's situation. The person wants to know that you understand the situation. An angry person does not want to hear (and probably is unable to hear) that he or she is wrong.
* Express empathy by responding to what the person says and feels. Expressing empathy does not mean you agree with the individual. It means simply that you recognize and respond to what the person is experiencing.
* If an apology is in order, apologize for the specific incident and no more.

Step 3. Calm the individual by questioning and verifying.

By asking questions you can verify your understanding of the situation and also demonstrate that you are willing to work with the person. This also helps the person to work with you.

* Ask questions to get specific information about the problem. Never assume that you understand.
* Give the person responses to show that you understand the problem.
* Be sure that you and the person fully understand the problem.

Step 4. Involve the person in solving the problem.

The next step is to get the person to cooperate in exploring alternate solutions. Show that you are interested in solving the problem. By discussing all alternatives and the consequences of each solution, you can keep the party focused on the problem and thereby avoid side issues.
* Ask the person to help you solve the problem. Request suggestions for solving the problem, and offer your assistance to help correct the situation. Your knowledge of erosion and sediment control can guide the party to a reasonable and legal solution.
* Explain the applicable regulation and the reasoning behind it. Often frustration and adversity are reduced when citizens are made aware of the intent of the rules.
* Continue to ask questions in order to keep the person focused on solving the problem. If the individual is still angry, continue to empathize, showing that you understand the problem.

Step 5. Handle the problem

Having explored the possible solutions, focus on the most feasible and satisfying solution. Be positive with the person. Explain what you are going to do in a way that the person understands.
* If he resists, go on to another alternative. Be as helpful as you can. Satisfying the person's desire for service and special attention can sometimes turn an opponent into an advocate.
* Decide upon a follow-up action to ensure that the problem has been resolved satisfactorily.

Being the Bearer of Bad News

There will be times when you will have to be the bearer of bad news. You may have to tell a person that you cannot solve a complaint to his or her satisfaction, or you may have to inform a responsible party of a violation. These situations can be very stressful for both you and the other person. The following section lists key steps that will help prepare you to deliver bad news.

Key Steps

Step 1. Present the situation.

Explain the situation to the person with as few words as possible. When your discussion is concise, direct, and to the point, the person is spared the anxiety of wondering how bad the news is.
* Prepare the person for the negative information. It may be necessary to provide a short background about the events leading up to the present situation.

* Provide reasons why the situation has occurred. You may be able to show that the person's actions were not responsible for the situation.
* Do not try to give the person good news first and then the bad news--this can appear patronizing.
* Do not make the bad news seem insignificant; it probably is not insignificant to the person involved.

Step 2. Allow the person time to adjust.

Most people need a little time to collect their thoughts and react emotionally to bad news. Allow the person some time, but try not to leave long periods of silence. Some people perceive silence as pressure to react and therefore may react inappropriately.
* Try discussing the positive aspects of the situation. The person may or may not hear you, but positive comments can help keep the conversation constructive and the outlook optimistic.

Step 3. Accept the person's reaction.

Allow the person to express his or her feelings and opinions. It is normal to react emotionally to bad news. Allowing people to ventilate their emotions shows that you accept their feelings and helps to reduce the negative aspects of the situation.
* If the person does not offer a reaction, try talking briefly about how you have felt or would feel in a similar situation. Then ask for the person's reaction. Use this technique to stress that you are empathetic to the other person's dilemma. However, do not get caught up in discussing your own troubles.

Step 4. Demonstrate acceptance of the person's reaction.

A person may react emotionally in many different ways and may not clearly express his or her feelings. By accepting their emotions you reaffirm them as valuable and important.
Most of us find it hard to talk about emotions in the workplace, and we have trouble accurately identifying the emotions of others. You must observe and listen carefully to determine if the person's true feelings are being expressed.
* When receiving bad news, the person may feel a wide range of emotions, such as anger, dissatisfaction, embarrassment, or confusion. Respond to these emotions by remaining calm, expressing empathy, offering reassurance, or providing further explanation.
* Try to mentally identify or name the emotion that the person is feeling. Identifying the person's reaction allows you to accept the reaction for what it is -- that is, not a personal affront to you. Understanding how the other party feels also helps you anticipate upcoming statements and remain in control of your own emotions.
* People often react by blaming another person, a group, or the system. The person is simply reacting from his anger -- try not to take it personally.

* Avoid being caught in answering questions that are really meant as statements. For instance, "Don't you think this is unfair?" really means "I think this is unfair." Restate the question as "I understand that you think this is unfair."
* Sometimes you may be able to use self-disclosure to diffuse the situation. In other words, state how you have felt in similar situations. Statements such as, "I know just how you feel," can be taken as patronizing. Rather, say, "I know how I've felt in situations like this."

Step 5. Restate positive points.

Once the initial emotional reaction has passed, help the person put the situation into perspective.
* You can help the person see the situation more positively by expressing confidence in his or her ability to meet the challenge and by providing genuine praise for efforts put forth.
* Reemphasize the basic facts about the situation and discuss any steps that can be taken to address the problem.

Step 6. Offer assistance.

If appropriate, you can offer to assist the person in future actions or planning.
* Do not offer to do something that you are not authorized to do.
* Inform the person that it may be necessary to submit revised plans and/or seek professional help.

Step 7. Clearly express that violations must be corrected.

An emotionally upset person may not be able to fully understand the situation or may intentionally misunderstand the conversation. Be sure that the person understands the information you have provided and knows what is expected to correct or address the situation.
* Repeat the actions that must be taken by all parties, and the required time frames.
* Discuss the required action. If you cannot change the requirements or time frames, tell the person that you regret that you cannot change them.
* A good way to ensure that the person understands the information you have discussed is to ask the person to repeat the details of your discussion in his or her own words. For example, "I want to be sure I haven't said something that might be misunderstood. Would you tell me, in your own words, your understanding of this discussion?"

Step 8 Allow for future contact and follow-up.

Give the person a chance to contact you for further discussion. You may need to schedule a future meeting. You should always give the person your business card and phone numbers where you can be reached.
* Confirm, in writing, the conclusions reached so that all parties have a similar basis for their understanding of the situation.

Estimating Quantities

Piles

Piles can often be conveniently measured by calculating the volume of regular masses of similar outline, and making plus or minus adjustments for differences. A pile of clean, dry sand may have a conical shape, or be a ridge with a triangular cross section, ending in half cones. Measurements should be taken to determine base size and height. The area of the circular base of a cone is found approximately from the circumference by the formula:
Area = Circumference^2 12.6 and from half the diameter by:
Area = 3.14 x Radius^2
The volume of a cone is the height times one third the base area. The long part of the pileis figured by the formula:
Volume = Height x Width x Length
A long pile will have the volume of the center section, plus the volume of one cone, as each of the ends is a half cone.

Excavated Pond

The volume of excavation required can be estimated with sufficient accuracy by use of the prismoidal formula:
V = (A + 4B + C) x D, where:
6 27
V = Volume of excavation, in cubic yards.
A = Area of the excavation at the ground surface, in square feet.
B = Area of the excavation at the mid-depth point (1/2 D), in square feet
C = Area of the excavation at the bottom of the pond, in square feet.
D = Average depth of the pond, in feet
27 = Factor converting cubic feet to cubic yards.

Sample Check Lists

The example checklists provided can be a basis for creating specific checklists tailored for the specific duties and conditions of each public or private concern.

GENERAL INFORMATION

Some or all of the following information should appear on all checklists:
Project name
Permit number
Property parcel number
Name of inspector / reviewer
Name of design professional
Weather; or date and amount of last rain event

WARNING !

The checklist is an excellent tool for organizing yourself for an inspection or plan review. Like any other tool, the checklist can and will hurt you if not used properly ! It is only a tool, not a substitute for the human mind. The checklist can lull you into a false sense of completeness and security. After using a checklist, ask yourself " Is there anything else?; anything which is not covered in the checklist? " Periodically examine your checklists to make sure that they cover the issues which you encounter and that they stay current with any changing regulations or other conditions.

1. Plan Review

Narrative

Project description A brief description of the nature and purpose of the land-disturbing activity and the amount of grading involved

Existing site conditions A description of the existing topography, vegetation, and drainage

Adjacent areas A description of neighboring areas, such as streams, lakes, residential areas, and roads that might be affected by the land disturbance

Soils A brief description of the soils on the site including erodibility and particle size distribution

Critical areas A description of areas within the developed site that have potential for serious erosion or sediment problems

Erosion and sediment control measures A description of the methods that will be used to control erosion and sediment on the site

Permanent stabilization A brief description of how the site will be stabilized after construction is completed

Maintenance A schedule of regular inspections and repairs of erosion and sediment control structures

Site Plan or Map

Vicinity Map A map which shows the project located within a larger region, including principle roads

North Arrow

Existing contours Existing elevation contours of the site at an interval sufficient to determine drainage patterns

Preliminary and final contours Proposed changes in the existing elevation contours for each stage of grading

Existing vegetation Locations of trees, shrubs, grass, and unique vegetation

Soils Boundaries of the different soil types within the proposed development

Critical areas. Areas within or near the proposed development with potential for serious erosion or sediment problems.

Existing and final drainage patterns. A map showing the dividing lines and the direction of flow for the different drainage areas before and after development

Limits of clearing and grading. A line showing the area to be disturbed

Erosion and sediment control measures. Locations, names, and dimensions of the proposed temporary and permanent erosion and sediment control measures

Stormwater management system. Location of permanent storm drain inlets, pipes, outlets, and other permanent stormwater management facilities (swales, waterways, etc.); and sizes of pipes, channels, and structures

Details

Detailed drawings. Enlarged, dimensioned drawings of such key features as sediment basin risers, energy dissipators, and waterway cross sections

Seeding and mulching specifications Seeding dates, seeding, fertilizing, and mulching rates in pounds per acre (kilograms per hectare), and application procedures

Maintenance program Inspection schedule, spare materials needed, stockpile locations, and instructions for sediment removal and disposal and for repair of damaged structures

Calculations

Calculations and assumptions Data for design storm used to size pipes and channels, and sediment basins and traps; design particle size for sediment traps and basins; estimated trap efficiencies; basin discharge rates; size and strength characteristics for filter fabric, wire mesh, fence posts, etc.; and other calculations necessary to support stormwater, erosion, and sediment control systems

2. Pre-construction Conference

Verify the following

Permits Check that contractor / developer has all required permits, including, but not limited to: Federal, FDEP, FDOT, Water Management District, local or municipal, building permit if required.

Licenses Get the name, license number, and type of license for all contractors involved in site development.

Contacts Get the name, phone number, and mailing address of the property owner and all contractors involved in site development.

Special Conditions Check for special conditions attached to any permits. This could be one of the must crucial aspects of the permit.

Discuss the following

Plans and scope of work Be sure that the contractor understands the plans and the tasks to be performed.

Special Conditions Point out that any special conditions are as valid and enforceable as the permit itself, they are not optional. Make sure that everything is clearly understood. Write down any unresolved issues and follow up quickly.

Erosion and sediment controls Discuss the location, proper installation, and maintenance requirements of BMPs. Examine the erosion and sediment control details.

Buffers and natural areas must be protected Discuss the methods used to protect these areas. Be sure that they will not be used for parking, portable toilets, material storage, waste disposal, or other unintended uses.

Tree Protection Verify the location and type of protected trees which will remain. Discuss protection requirements and methods. Be sure that protected areas will not be used for parking, etc.

Construction sequencing The construction sequence will be enforced. Perimeter controls, sediment traps and basins, and necessary conveyances will be installed and stabilized before the rest of the site is cleared.

Performance oriented regulations Be sure that the contractor understands that the site will be out of compliance if erosion and sediment controls fail, even if everything has been done according to plan. In that event additional measures will be required.

Plan Changes No construction will be allowed which differs from the plans. Major changes to the erosion and sediment control plan, and any changes to the site development plan will require re-approval. Minor changes to the erosion and sediment control plan must be approved by the inspector.

Routine Inspections Advise the contractor that you will be monitoring this site for proper installation and diligent maintenance of BMPs

Final Inspection A final inspection will be performed when all permitted improvements have been completed. Inform the contractor about the documents which will be required at that time (ie. Operating permit, Post-construction certification, As-built drawings, etc.).

Penalties for non-compliance Save the best news for last.

Inspect the site

Walk or drive around the site with the contractor. Point out any potential problems on- or off-site. Tell the contractor what you will be looking for on your next inspections.

Affirmation

Provide the owner /contractor with a copy of your check list and make sure again that everything has been discussed and clearly understood. Note any

clarifications, agreements, and unresolved issues. Sign and date all copies and have themdo the same.

3. **Routine Inspection - Maintenance . Inspection**
   Control measure Problems to look for Possible remedies
   - Vegetation Rills or gullies forming Check for top-of-slope diversion and install if needed.
   - Bare soil patches Fill rills and regrade gullied slopes, revegetate.
   - Sediment at toe of slope Remove sediments, revegetate using site appropriate methods.
   - Dikes Gully on slope below dike breach; wheel track or low spot in dike
   - Add soil to breaches or low spots and compact.
   - Loose soil Compact loose soil.
   - Erosion of dike face Line upslope face with riprap, or revegetate using site appropriate methods.
   - Swales Gully on slope below swale Repair breaches.
   - Wheel track, low point (water ponded in swale)
   - Build up low areas with compacted soil or sandbags or rebuild swales w/ positive slope.
   - Sediment or debris in channel
   - Remove obstructions.
   - Erosion of unlined channel surface
   - Mulch and install anchored sod or erosion control blanket; or line swale w/ riprap; or install check dams; or realign swale on gentler gradient; or divert some or all stormwater to a more stable facility.
   - Erosion of channel lining Install larger riprap; or reseed, mulch, and anchor w/ netting; or install check dams; or pave swale
   - Pipe slope drain or flume
   - Blocked inlet or outlet Remove sediment and debris.
   - Runoff bypassing inlet Enlarge headwall or flare out entrance section.
   - Erosion at outlet Enlarge riprap apron and use larger riprap; or convey runoff to a more stable outlet.
   - Grassed waterways
   - Bare areas Revegetate w/ anchored sod or erosion control blanket; divert flow during establishment period.
   - Channel capacity reduced by tall growth
   - Mow grass
   - Riprap lined waterway
   - Scour beneath stones Install proper geotextile or graded bedding. Make sure edges of geotextile are buried.
   - Dislodged stones Replace w/ larger stones.
   - Outlet protection Erosion below outlet Enlarge riprap apron; or line receiving channel below outlet; or convey runoff directly to a more stable outlet. make sure discharge point is on level or nearly level grade.
   - Outlet scour Install proper geotextile or graded bedding beneath riprap apron.

- Dislodged stones Replace w/ larger stones.
- Sediment traps and basins
- Sediment level near outlet elevation in traps, remove sediment if less than 1 ft.(0.3 m) below outlet elevation; in basins, remove sediments if less than 2 ft.(0.6 m) below top of riser.
- Obstructed outlet Remove debris from trash rack.
- Basin not dewatering between storms
- Clear holes. Clean or replace sediment-choked gravel surrounding dewatering hole or subsurface drain.
- Damaged embankments Rebuild and compact damaged
- areas.
- Spillway erosion Line spillway w/ rock, geotextile, or pavement.
- Sediment traps and basins
- Outlet erosion Make sure outlet is flush w/ ground and on level grade. Install, extend or repair riprap apron as required; or convey discharge directly to a more stable outlet.
- Riser flotation Anchor riser in concrete footing.
- Excessive discharge to and Check runoff patterns for from basin or trap consistency w/ plans.
- Reroute part of volume to another basin or enlarge the basin.
- Sediment storage zone fills too quickly.
- Increase size of basin; or stabilize more of the contributing area.
- Straw bale barrier Bale displacement Anchor bales securely w/ proper stakes or rebars. Check drainage area, slope length and gradient behind each barrier.
- Undercutting of bales Entrench bales to proper depth, backfill, and compact the soil.
- Gaps between bales Restake bales. Drive first stake in each bale at an angle to force it snug against the adjacent bale.
- Baling wire broken Retie bale or replace w/ fresh bale.
- Bale disintegrating Replace w/ fresh bale.
- Runoff escaping around barrier
- Extend barrier or reposition in center of flow path.
- Sediment level near top of bales
- Remove sediment when level reaches half of barrier height.
- Silt fence Undercutting of fence Entrench wire mesh and fabric to proper depth, backfill, and compact.
- Fence collapsing Check post size and spacing, gauge of wire mesh and fabric strength.
- Check drainage area, slope length and gradient behind barrier.
- Correct any substandard condition.
- Torn fabric Replace w/ continuous piece of fabric from post to post, attach w/ proper staples.
- Runoff escaping around fence
- Extend fence.

- Sediment level near top of fence
- Remove sediment when level reaches half of fence height.
- Check dam Sediment accumulation Remove sediment after each storm.
- Flow escaping around sides of check dam
- Build up ends of dam and provide low center area for spillway.
- Displacement of sandbags, stones, or straw bales
- Check drainage areas and peak flows. Reinforce dam w/ larger stones, etc.; or divert part of flow to another outlet.
- Inlet protection Flooding around or below inlet
- Remove accumulated sediment; or convert sediment barrier to an excavated sediment trap; or reroute runoff to a more suitable area.
- Undercutting of bales or silt fence, bale displacement, torn fabric, etc.
- See remedies for straw bale barriers and silt fences.

4. Final Inspection

General

Are all Final Inspection documents in order (As-Built drawings, Compliance Report, Postconstruction Certification, Operating Permit, etc.)?
Are all applicable easements recorded with the Clerk of the Court?
Are the roads, buildings, parking, sidewalks, etc. as shown on plans?
Is there any significant change in impervious area?
Did natural or undisturbed areas remain that way?
Are all utilities installed (not necessarily hooked-up)?
Are there any outstanding violations or fees?
Is there any off-site disturbance or adverse impact from this project?

Stormwater Facilities

Is the stormwater management facility (pond or ponds) where it should be?
If the facility is underground, is there access for maintenance?
Is the facility the size and depth it should be?
Are the slopes as shown on plans and stabilized?
If applicable, is the stormwater facility fenced?
Are the control structures as shown and clean?
Is the filter system as shown and clean?
Are energy dissipators as shown and stabilized?
Is the pond bottom free of sediments?
Are aquatic plantings installed as shown and in good condition?
Does the facility meet minimum performance standards as permitted (treatment and volume recovery)?

Stormwater Conveyance

Is the conveyance system as shown and free of debris, stabilized?
Are all inlets as shown and clean?
Are roof drains as shown?
Is all water on site directed to ponds, except accessways?

Landscaping/Natural Areas

Are natural buffers existing and undisturbed?
If buffers were to be augmented, have they been?
Is uncomplimentary land use buffer, if applicable, as shown and planted or fenced to meet permit/code requirements?
Can buffer areas be accessed for maintenance?
Are landscape islands in parking areas as shown?
Is perimeter landscaping as shown?
Are all landscape areas protected by curbing , wheelstops, or other physical barrier?
Do all landscape areas have access to irrigation?
Do all plantings conform to the approved landscape schedule?
Are all seeded areas firmly established?
Is all sod firmly established, properly anchored?

REFERENCES

City of Jacksonville Water Quality Division. Erosion and Sediment Control Inspector's
Guide. Jacksonville, FL
North Carolina Department of Environment, Health, and Natural Resources. State of North
Carolina Erosion and Sediment Control Inspector's Guide. Raleigh, NC
Goldman, S.J, K. Jackson, and T.A. Bursztynsky. 1986 Erosion and Sediment Control
Handbook. McGraw-Hill, Inc. New York, NY
Leon County Growth & Environmental Management. 1990 "Inspection Checklists"
Tallahassee, FL

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